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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/612,069	07/03/2003	Mark Alexander Groninger	0142-0416P	3514

2292 7590 08/01/2007
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EXAMINER	
NGUYEN, LAM S	
ART UNIT	PAPER NUMBER
2853	

NOTIFICATION DATE	DELIVERY MODE
08/01/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/612,069	GRONINGER ET AL.	
	Examiner	Art Unit	
	LAM S. NGUYEN	2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 July 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 July 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1, 4-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang (US 5757392) in view of Yasutomi (JP410235860A).

Referring to claims 1, 7-8:

Zhang discloses a method of controlling an inkjet printhead in an ink jet printer containing a substantially closed duct (*FIG. 8, element 10: The closed duct is expressed as "the pressure chamber"*) in which ink is situated, said duct having at least one exit opening for the ink (*FIG. 8, element 22: The exit opening is expressed in term of "nozzle"*), which comprises:

setting a required pressure change for obtaining an ink drop ejection in which the drop has size and speed of which at least one is previously known (*FIG. 7: Since the drive voltage is predetermined, the pressure change in the closed duct due to the application of said drive voltage is correspondingly determined as indicated as the graph PRESSURE NEAR THE NOZZLE and AVERAGE PRESSURE IN THE PRESSURE CHAMBER, the size and speed of the ink droplet are also determined (ideally known as a designed or target value) corresponding to the drive voltage*),

applying an actuation pulse (*FIG. 7: DRIVE VOLATGE*) to an electro-mechanical transducer (*FIG. 8, elements 16, 60*) so that the pressure in the duct changes (*The actuation pulse*

is a combination of a group of pulses including pulse Pp for causing ink ejection to form image (column 7, lines 39-46) and pulse Pc for negating (damping) pressure fluctuations in the pressure chamber (column 7, lines 49-52). Zhang's drive voltage thus reads on the applicant's actuation pulse defined as a group of pulses including a pulse for causing ink ejection (52) and pulses for damping (53-54) the pressure in the ink duct (FIG. 5B and specification, paragraph [0038], lines 10-18));

measuring (by a measuring unit) an electric signal generated by the electro-mechanical transducer real time during the application of the said pulse (*column 7, lines 60-67: Residual pressure fluctuations in the pressure chamber (after application of the pulse voltage Pp) causes the piezoelectric element to generate an electrical signal Vs that is detected and used to calculate the voltage pulse Pc required for negating residual pressure fluctuations in the pressure chamber 10 (column 8, lines 11-15). The process is considered real time because the detection is done after the application of pulse Pp and before the application of pulse Pc. In other words, the detection is done during the application of the actuation pulse, as defined above, comprising both pulse Pp and pulse Pc*), and

real time adapting (by a control unit) the same actuation pulse on the basis of the measured signal to obtain the said required pressure changes, thus ejecting an ink drop from the exit opening an ink drop having the size and speed of which at least one is previously known (*column 8, lines 10-15: The calculation circuit 34, based on the detection signal Vs, calculates the voltage pulse Pc (of the same actuation pulse) for compensating the residual pressure fluctuations in the duct. Since the residual pressure fluctuation in the pressure chamber affects the ink drop in the current or next driving cycle, the adjustment of the voltage pulse Pc to*

compensate for residual pressure fluctuation in the pressure chamber to bring the pressure change (in term of time or level) back to a desire value causes the size and/or speed of the ink drop to be maintained as a designed/target value). (*Please noticed that the process is considered real time because the adapted pulse Pc and the pulse Pp are of the same actuation pulse*).

Zhang, even though teaches measuring an electrical signal generated by the transducer and adapting the actuation pulse based on the measured electric signal, but does not teach measuring the electrical impedance of the transducer and adapting the actuation pulse based on the measured impedance.

Yasutomi discloses a process in an ink jet printer comprising an electromechanical transducer (*FIG. 3, element 313*) for causing ink ejection from a pressure chamber (*FIG. 3, element 305*) in accordance to the application of an actuation pulse, wherein the process includes steps of measuring electric impedance of the transducer and adapting the actuation pulse on the basis of the measured impedance (*Abstract and paragraph [0059]*) in order to maintain a high quality for the recorded images regardless of the fluctuations of the surrounding temperature (*paragraph [0005]*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify Zhang's process to also measure the electric impedance of the transducer and adapt the actuation pulse based on the measured impedance as disclosed by Yasutomi.

The motivation for doing so would have been to maintain a high quality for the recorded images regardless of the fluctuations of the surrounding temperature by detecting the physical

properties of the transducer that are changed by surrounding temperature as taught by Yasutomi (*paragraph [0008]*).

- **Zhang also discloses the following claimed inventions**:

Referring to claim 4: which is used to attain the pressure required to eject the drop at a specific speed and at a predetermined time (*column 14, lines 22-27: Ejecting a liquid droplet with a set volume at a predetermined speed at a time which matches a suitable pressure level in the pressure fluctuation*).

Referring to claim 5: which is used to change the pressure after the ejection of the drop and wherein after the ejection of the drop, the pressure is brought substantially to a reference value (*After the ejection of a drop due to the application of pulse Pp, the application of the adapted pulse Pc certainly changes the pressure respect to a case where the pulse Pc is not adapted or applied*).

Referring to claim 6: wherein after the ejection of the drop, the pressure is brought substantially to a reference value (*column 9, lines 5-8: The pulse Pc is calculated so that the residual pressure fluctuation can be precisely reduced. Therefore, the pressure in pressure chamber 10 is stable. In other words, the application of pulse Pc brings the pressure to a reference value at that the pressure is stable*).

2. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang (US 5757392) and Yasutomi (JP410235860A) as applied to claim 1, and further in view of Niikawa et al. (US 4866326).

Zhang, as modified, discloses the claimed invention as discussed above and also teaches

wherein the actuation pulse applied to the electromechanical transducer is a voltage pulse (*Abstract*).

Zhang, as modified, however does not teach measuring a reacting current generated by the electromechanical transducer.

Niikawa et al. discloses an ink jet printer having a piezoelectric actuator (electromechanical transducer) for causing ink ejection when a voltage is applied to charge and deform the piezoelectric actuator (*column 1, lines 18-25*), wherein during the charge period (*FIG. 10, step S306: Transistor 131 is turned on to provide charge energy to the piezoelectric actuator 102*), a charge current (reacting current) is detected and fed back to a voltage controller (*column 13, lines 21-27 and FIG. 10, step S308: The current is detected and fed back to controller 130*) in order to determine the voltage across the piezoelectric element (*column 13, lines 25-30*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify Zhang's ink jet printer, as modified, to include the step (or an element) for measuring the charge current (reacting current) as disclosed by Niikawa et al.

The motivation for doing so would have been to suitably control the voltage across the piezoelectric element based on the relationship between the detected current and a reference or target value in order to obtain consistent operated position of the piezoelectric element irrespective of its temperature as taught by Niikawa et al. (*column 13, lines 30-43*).

Response to Arguments

Applicant's arguments filed 07/02/2007 have been fully considered but they are not persuasive.

First of all, in response to the applicant's argument that in Zhang reference, the drop size and/or speed can only be adjusted for subsequent droplets, the examiner cites that because the claim language does not clearly define wherein only one ink droplet is ejected due to the step of applying of the actuation pulse and the step of adapting the same actuation pulse, the claim language can broadly be interpreted as that the applying of an actuation pulse causes an ejected ink drop and the step of adapting the same actuation pulse causes a subsequent ejected ink droplet having a previously known size or speed.

In addition, regarding to reference Yasutomi, the applicant admitted that Yasutomi suggested that instead of measuring resistance, the impedance could also be used to detect physical properties. Thus one of ordinary skill in the art would look to Yasutomi's teaching to modify Zhang's technique by measuring the impedance rather the resistance.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S. NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D. MEIER can be reached on (571)272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LAM SON NGUYEN